

0 $\nu\bar{\nu}$ -decay Working Group Update

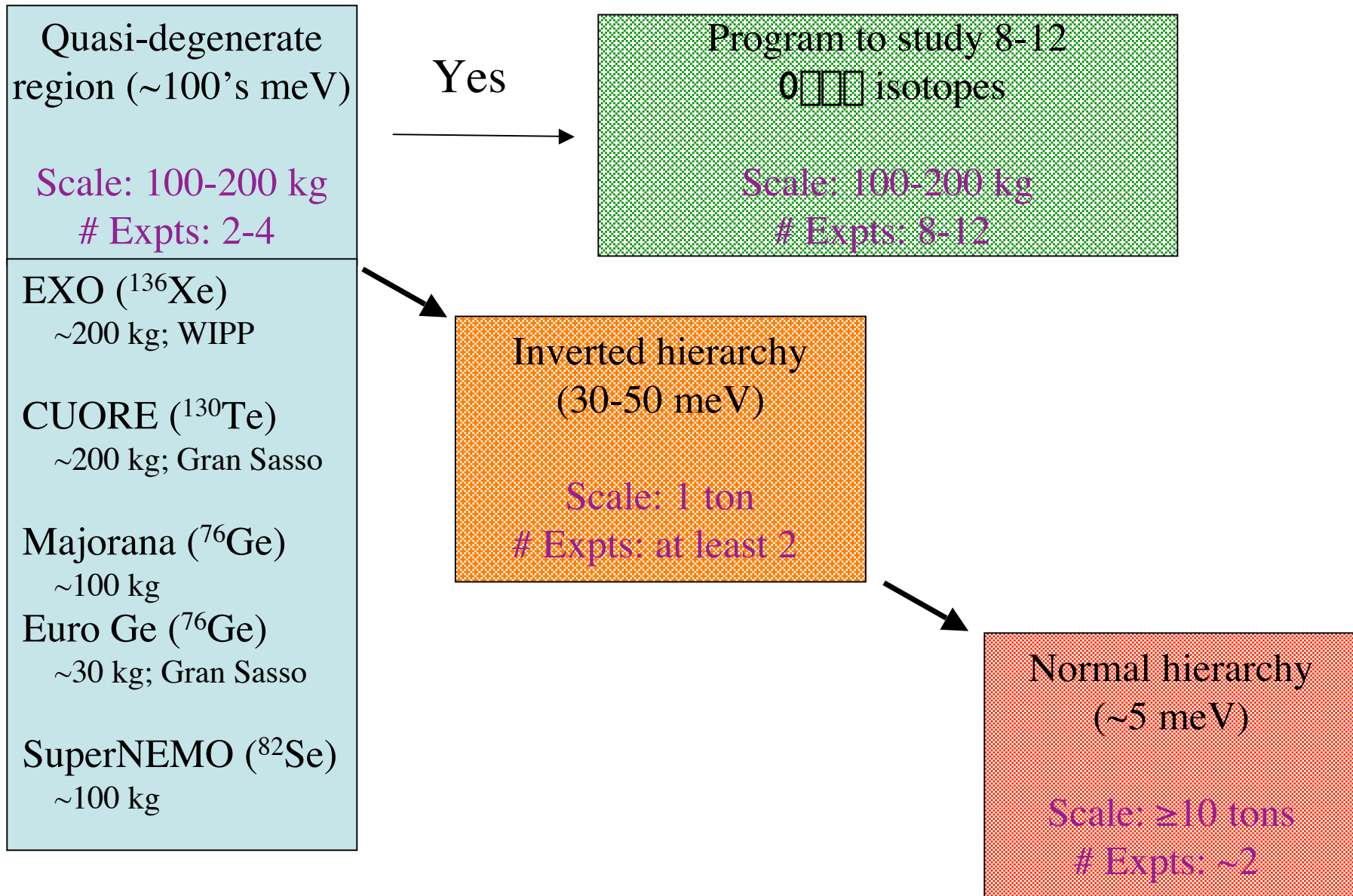


Physics motivation and justification

- Build on and within the context of recent studies
 - *OSTP: A 21st Century Frontier of Discovery: The Physics of the Universe*
 - *NRC: Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century*
 - *NRC: Neutrinos: New Windows on the World*
 - *DOE: Facilities for the Future of Science: A Twenty Year Outlook*
 - *NSAC: Opportunities in Nuclear Science: A Long-Range Plan for the Next Decade*
 - *HEPAP: The Science Ahead, The Way to Discovery: The High Energy Physics Advisory Panel Long Range Plan*
- Strong overlap with the *DNP/DPF/DAP/DPB Joint Study on the Future of Neutrino Physics*
 - 0 $\nu\bar{\nu}$ -decay and neutrino mass working group (Elliott and Vogel)
 - Intend to be consistent with the APS recommendation
- Draft physics statement

“Zero-neutrino double-beta decay can occur if neutrinos are massive Majorana particles. Experiments searching for this process should reveal the Majorana or Dirac nature of neutrinos and potentially can address two of the fundamental properties of neutrinos: their mass and lepton number conservation.”

The vision thing ... the $0\nu\nu\nu$ roadmap



Technical requirements



- Good starting point – reasonable information from previous studies
 - 2001 Lead White Paper (Aalseth & Elliott)
 - Original “Homestake Project Book” (2003)
- Have agreements from current collaborations to provide info.
 - Ideal optimized space vs. constrained available space
 - Longer range needs less clear
- Additional considerations to “Strawman” Technical Requirements
 - Mechanical sensitivity to seismic events
 - limited access periods
- Need to take into account the roadmap’s “dual paths”
 - many smaller experiments, shorter duration
 - a few large experiments, of long duration

0 ν 0 ν -decay Issues and Summary



- Time scale for current 100–200 kg scale experiments not necessarily compatible with DUSEL timescale.
 - EXO – WIPP
 - Majorana – WIPP, SNOLab, or DUSEL?
- Would existing experiments relocate to DUSEL as they evolve to larger 1–10 ton scale experiments?
- Depth requirements
 - Experiment dependent
 - Hard to quantify, but viewpoint of most collaborations is deep
 - Multi-purpose (Dark Matter or Solar ν) requires deep
- DUSEL coupled with the current U.S. efforts is an ideal situation to explore 0 ν 0 ν physics.